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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup>:</b> <b>C11D 3/00, 3/37, 3/386</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 95/06098</b> <b>(43) International Publication Date:</b> 2 March 1995 (02.03.95)
<b>(21) International Application Number:</b> PCT/GB94/01882 <b>(22) International Filing Date:</b> 30 August 1994 (30.08.94) <b>(30) Priority Data:</b> 9317803.6                      27 August 1993 (27.08.93)                      GB  <b>(71) Applicant (for all designated States except US):</b> CUSSONS (INTERNATIONAL) LIMITED [GB/GB]; Bridgewater House, 60 Whitworth Street, Manchester M1 6LU (GB).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> HALLIWELL, Duncan, Cooper [GB/GB]; 45 Higher Ridings, Bromley Cross, Bolton BL7 9HD (GB). ASPIN, Paul [GB/GB]; 2 Hood Close, Tyldesley M29 8PN (GB). HARRISON, Andrew, John [GB/GB]; 3 Coney Walk, Saughall Massey, Upton, Wirral, Merseyside L69 3RB (GB).  <b>(74) Agent:</b> ATKINSON, Peter, Birch; Marks & Clerk, Suite 301, Sunlight House, Quay Street, Manchester M3 3JY (GB).		<b>(81) Designated States:</b> AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> LAUNDRY DETERGENT COMPOSITION  <b>(57) Abstract</b>  A laundry detergent composition comprises at least one surface active agent and a polyvinylpyrrolidone having a molecular weight greater than 1,000,000. The high molecular weight PVP is particularly effective for scavenging dye during washing and preventing its redeposition on other garments in the same wash load. An optional further component is a cellulase.		

LAUNDRY DETERGENT COMPOSITION

The present invention relates to a laundry detergent composition intended particularly but not exclusively for domestic laundering operations.

One problem which may be encountered in laundry operations is that dye from one garment may become dissolved in the wash water and then deposit on one or more other garments causing discolourations thereof. The problem can be particularly acute if garments of a relatively dark or deep colour are washed together with light coloured (e.g. white) or mixed garments which can become significantly discoloured.

It is known that polyvinylpyrrolidone (PVP), when incorporated in a laundry detergent formulation, will act as a dye transfer inhibitor.

Thus, for example, WO-A-9218598 proposes a composition having colour care properties and containing a polyvinylpyrrolidone polymer having a molecular weight of 5,000 to 1,000,000, more preferably from 5,000 to 50,000, most preferably from 8,000 to 15,000. In addition to a surface active agent, the composition also contains an alkaline cellulase. Furthermore, WO-A-9218597 discloses a laundry detergent composition containing polyvinylpyrrolidone having a molecular weight of 5,000 to 22,000. This formulation may also contain a cellulase.

We have now surprisingly found that the use, in a laundry detergent composition, of polyvinylpyrrolidone having a higher molecular weight than previously proposed for use in laundering operations leads to improved colour care performance.

Therefore according to the present invention there is provided a laundry detergent composition comprising at least one surface active agent and a polyvinylpyrrolidone having a molecular weight of greater than 1,000,000.

Molecular weight of polyvinylpyrrolidone as used in the invention is determined by SEC/LALLS (Size Exclusion Chromatography/Low Angle Laser Light Scattering) using the method disclosed in Journal of Liquid. Chromatography, 10(6), 1127-1150(1987) (Senak et al).

We have found that PVP having a weight average molecular weight greater than 1,000,000 is particularly effective for scavenging

ionics are water-soluble alcohol ethoxylates of HLB lower than 13. Such non-ionics are preferably C<sub>12</sub>-C<sub>18</sub> linear primary alcohols with 3 to 30 moles of ethylene oxide per mole of alcohol.

The amount of non-ionic surfactant present is preferably 1% to 15% (e.g. 1% to 10%) by weight.

Mixtures of surfactants may be used.

It is highly preferred that the detergent composition also incorporates a cellulase. The function of the cellulase (in relation to garments containing cellulosic, e.g. cotton fibres, is to digest microfibrils which are generated on the fibres. This prevents pilling of the garment and reduces reflectance. We have found that there is synergy between the higher molecular weight PVP used in the invention (i.e. molecular weight greater than 1,000,000) and cellulase in reducing reflectance of the fabric caused by fibrils generated by normal wear of the garment.

Examples of cellulases which may be used are those exemplified in WO-A-9218598. Generally the amount of cellulase used will be in the range 0.05% to 4% (e.g. 1% to 4%) by weight of the composition.

The formulation will generally also include a builder usually in an amount of 15% to 50% by weight. The preferred builders are phosphates, particularly sodium tripolyphosphate and ortho- and pyrophosphates. An alkaline material may also be included, e.g. in an amount 15% to 35%, to provide performance benefits in the laundering process. The preferred alkaline material is sodium carbonate.

Other components which may be present in the formulation, the typical amounts in which they may be present, and specific examples thereof are shown in the following table.

<u>Component</u>	<u>Amount</u>	<u>Example</u>
Filler	0-50%	Sodium Sulphate
Anti-Redeposition Agent	0.5-5%	Sodium Carboxymethyl Cellulose
Corrosion Inhibitor	0-5%	Sodium Metasilicate
Sequestering Agent	0%-5% EDTA	
Perfume	<1%	
Optical Brightener	<1%	

Composition A (Invention)

Sodium Tripolyphosphate	31% by weight
Sodium Carbonate	27% by weight
Sodium Sulphate	12.5%
Sodium Bicarbonate	13%
Sodium Carboxymethylcellulose	4%
Alkyl Benzene Sulphonic Acid	8%
Polyvinylpyrrolidone (K-120 ex ISP)	0.5%
Celluzyme 0.7T (ex Novo)	0.35%
Perfume, Antifoam, EDTA	1.65%
Ethoxylated Nonionic Surfactant	2%

Composition B (Comparative)

As for composition A but replacing PVP K-120 by PVP HP50 available from BASF. According to the manufactures literature, HP50 has a molecular weight of 40,000.

Composition C (Comparative)

A commercially available detergent containing neither PVP nor a cellulase enzyme.

Procedure

The above formulations were tested to determine their effectiveness in preventing deposition of dye (Solophenyl Blue GL) on white cotton fabric (scoured and bleached). The procedure was effected by washing the fabric in the presence of the dye in accordance with the conditions set out below using a Jefferies Rotadyer. This procedure was used because a known amount of dye is used and the results are more reproducible than is the case of a dyed fabric which can release dye on washing and cross-stain other fabrics.

Amounts Used:	Composition A	7g/litre
	Composition B	7g/litre
	Composition C	10g/litre

Fabric to liquor ratio 1:10

Test fabric: - 100% white cotton, scoured and bleach

either of the comparative compositions. Therefore these results show that compositions in accordance with the invention, incorporating the higher molecular weight PVP, are more effective for preventing dye deposition than the comparative compositions, including those which incorporate a lower molecular weight PVP.

### Example 2

Six detergent formulations were tested to determine the effectiveness of PVP having a molecular weight greater than 1,000,000 and cellulase in reducing reflectance of fabrics. The detergent formulations were as follows:

	<u>Formulation No.</u>					
	1	2	3	4	5	6
Sodium Bicarbonate	30%	30%	30%	30%	30%	30%
Sodium	30%	30%	30%	30%	30%	30%
Tripolyphosphate						
Dodecyl Benzene	10%	10%	10%	10%	10%	10%
Sulphonic Acid						
Sodium Sulphate	30%	28.57%	29.3%	29.3%	27.87%	27.87%
Celluzyme 0.7T	-	1.43%	-	-	1.43%	1.43%
PVP HP50	-	-	0.7%	-	0.7%	-
PVP K-120	-	-	-	0.7%	-	0.7%

The tests were carried out on a black cotton fabric which had previously been washed in a detergent formulation containing neither PVP nor cellulase enzyme.

The L value for each fabric was determined (after the aforementioned 2 washes) using an ICS/Texacon Micromatch MM2000 reflectometer.

The fabrics were then washed 10 times using formulations 1-6. The washing was carried out in a Tergotometer at 40°C for 30 minutes using an agitator speed of 90 rpm. The amount of each detergent formulation used was 10 g l<sup>-1</sup> and the water had a hardness of 30 ppm CaCO<sub>3</sub>.

After washing, the L value of each fabric was again determined. For each fabric the value of  $\Delta L$  was determined using the following

CLAIMS

1. A laundry detergent composition comprising at least one surface active agent and a polyvinylpyrrolidone having a molecular weight of greater than 1,000,000.
2. A composition as claimed in claim 1 wherein the polyvinylpyrrolidone has a molecular weight of at least 1,200,000.
3. A composition as claimed in claim 2 wherein the polyvinylpyrrolidone has a molecular weight of at least 1,500,000.
4. A composition as claimed in claim 3 wherein the molecular weight of the polyvinylpyrrolidone is 1,500,000 to 4,000,000.
5. A composition as claimed in claim 4 wherein the polyvinylpyrrolidone has a molecular weight in the range 2,400,000 to 3,400,000.
6. A composition as claimed in any one of claims 1 to 5 wherein the polyvinylpyrrolidone is present in the formulation in an amount of 0.01% to 2.0% by weight.
7. A composition as claimed in any one of claims 1 to 6 wherein the surfactant comprises an anionic surfactant.
8. A composition as claimed in claim 7 wherein the anionic surfactant is an alkyl aryl sulphonic acid.
9. A composition as claimed in claim 8 wherein the anionic surfactant is a linear straight chain alkyl benzene sulphonic acid in which the average number of carbon atoms in the alkyl group is 11 to 13.
10. A composition as claimed in any one of claims 7 to 9 wherein the anionic surfactant is present in an amount of 1% to 40%.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 94/01882

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 6 C11D3/00 C11D3/37 C11D3/386

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR,A,2 263 298 (BASF AG) 3 October 1975 see claim 1 ---	1
Y	TENSIDE SURFACTANTS DETERGENTS, vol.28, no.6, 1 November 1991, MÜNCHEN pages 428 - 433 H.-U. JÄGER; W. DENZINGER 'Wirkungsweise von Polymeren mit farbübertragungsinhibierenden Eigenschaften' see page 430; table 1 ---	1
A	DE,A,31 04 371 (HENKEL KGAA) 11 November 1982 see page 6, line 9 - line 16 --- -/--	1

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
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\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern. Application No

PCT/GB 94/01882

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